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Glenn Brown
Executive Director-
Public Policy

Ex Parte Presentation

May 22, 1996

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JULY 22 1996

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20541

Mr. William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street N.W., Room 222
Washington, D.C. 20554

RE: CC Docket 96-45

Dear Mr. Caton:

Attached hereto are copies of information providing detailed documentation for the Benchmark Cost Model. This information is being submitted in response to a request by the staff of the Accounting and Audits Division of the Common Carrier Bureau.

In accordance with Commission Rule 1.1206(a)(1), two copies of the letter are being filed with you for inclusion in the public record. Acknowledgment and date of receipt are requested. A copy of this transmittal letter is provided for this purpose. Please contact me if you have questions.

Sincerely,



cc: Rafi Mohammed
Gary Seigel

041

Explanation of BCM formulas and cells

DATA INPUT SHEET:

<u>Column</u>	<u>Label</u>	<u>Function</u>
A	Cli	Input - Common Language Location Identifier for Central Office (CO). This CO has been identified as the closest CO to the Census Block Group (CBG) listed in column C based upon the Co coordinates listed in NECA Tariff No. 4 and the coordinates of the centroid of the CBG listed in Census Bureau tape STF-3. The matching function was done by a Geographic Information System (GIS) -- ArcInfo.
B	Company	Input - Name of Company listed as the owner of the CO in Column A. This information is from NECA Tariff No. 4.
C	Block Grp #	Input - Census Block Group (CBG) Identification number established by the Census Bureau. This information is from Census Bureau Tape STF-3.
D	Quadrant	Input - The main feeder quadrant that serves the CBG. There are 4 Main feeder quadrants, 1-4, which correspond to East, North, West, and South. The Quadrant is determined by the Omega angle and calculated in the GIS ArchInfo system.
E	Omega	Input - This angle represents the counter-clockwise rotational angle between a line connecting the CBG with the closest CO and a line headed directly east from the CO. This angle is calculated by the GIS ArchInfo system.
F	Alpha	Input - This angle represents the angle between the main feeder route and the line connecting the the CO location and the the centroid of the closest CO. . This angle is calculated by the GIS ArchInfo system.
G	Centroid Distance Feet	Input - The airline distance between the CO location and the centroid of the CBG. This distance is calculated by the GIS ArchInfo system.
H	Total HH	Input - The total households reported in the CBG by the 1990 Census. The source of this data is the Census Bureau's Tape File STF-3.
I	Area Square Mile	Input - The area in square miles of the CBG as utilized in the 1990 Census. The source of this data is the Census Bureau's Tape File STF-3.

J	Density in HH/Sq. Mi	Input - The density of the CBG in households per square mile is calculated from the 1990 Census data from Tape STF-3 by the GIS ArchInfo system.
K	Rock Depth	Input - The average depth in inches to bedrock for the CBG. This data originates from the USGS in geologic polygons. Stopwatch Maps prepares the data for use by MapInfo software, where it is mapped in CBG geography.
L	Rock Hardness	Input - This is an indicator of the hardness of the bedrock. If the bedrock is classified as "Hard", the only effective construction techniques for moving through it are blasting or cutting with a rock saw. This data originates from the USGS in geologic polygons. Stopwatch Maps prepares the data for use by MapInfo software, where it is mapped in CBG geography.
M	Surface Texture	Input - This data describes the surface texture of the soil. It is used to determine the difficulty of construction. This data originates from the USGS in geologic polygons. Stopwatch Maps prepares the data for use by MapInfo software, where it is mapped in CBG geography.
N	Water Table Depth	Input - The average depth in inches to the water table for the CBG. This data is used to determine the difficulty of construction. This data originates from the USGS in geologic polygons. Stopwatch Maps prepares the data for use by MapInfo software, where it is mapped in CBG geography.

DATA MODULE - DATA & CALCS TAB:

All cells in the logic area are the same within a column. Each row represents a CBG. All rows have the same logic e.g. cells A1 through A5300 are exactly the same. The same is true for all columns A through AD.

**

Cell:

Column	Label	Formula
A	Cli	=Input
	Rural Low =	MNPLUTMA
	Rural High =	MNPLUTMA
	Urban Low =	OGDNUTNO
	Urban High =	OGDNUTNO

Description:

A carry forward of the CLLI code from the input sheet.

**

Cell:

Column	Label	Formula
B	Company	=Input

Rural Low = MOUNTAIN BELL - UT

Rural High = MOUNTAIN BELL - UT

Urban Low = MOUNTAIN BELL - UT

Urban High = MOUNTAIN BELL - UT

Description:

A carry forward of the Company from the input sheet

**

Cell:

Column	Label	Formula
C	Block Grp #	= Input

Rural Low = 490399721005

Rural High = 490399721006

Urban Low = 490572102021

Urban High = 490572102023

Description:

A carry forward of the Block Group # from the input sheet

**

Cell:

Column	Label	Formula
D	Quadrant	=Input

Rural Low = 1

Rural High = 4

Urban Low = 1

Urban High = 1

Description:

A carry forward of the **Quadrant** from the input sheet inputs.

**

Cell:

Column	Label	Formula
E	Omega	=Input

Rural Low = 327.22

Rural High = 262.48

Urban Low = 346.20

Urban High = 332.84

Description:

A carry forward of the **Omega** from the input sheet.

Cell:

Column	Label	Formula
F	Alpha	=Input

Rural Low = 32.78

Rural High = 7.57

Urban Low = 13.80

Urban High = 27.16

Description:

A carry forward of the **Alpha** from the input sheet.

Cell:

Column	Label	Formula
G	Cntrd Dist Ft	=Input

Rural Low = 1756.51

Rural High = 34677.37

Urban Low = 2737.66

Urban High = 14063.72

Description:

This is a carry forward of the Centroid Distance feet from the input sheet.

Cell:

Column	Label	Formula
H	Total HH	=Input

Rural Low = 338

Rural High = 311

Urban Low = 305

Urban High = 45

Description:

This is a carry forward of the Total Households from the input sheet.

Cell:

Column	Label	Formula
I	Area-SqMi	=Input

Rural Low = 0.57
 Rural High = 84.67
 Urban Low = 0.4
 Urban High = 6.83

Description:

This is a carry forward of the Total Households from the input sheet.

Cell:

Column	Label	Formula
J	Density-tothh/sqmi	=Input

Rural Low = 589.32
 Rural High = 3.67
 Urban Low = 769.67
 Urban High = 6.83

Description:

This is a carry forward of the Density to total house holds per square mile from the input sheet.

Cell:

Column	Label	Formula
K	Rock Depth	=Input

Rural Low = 60.00
 Rural High = 60.00
 Urban Low = 60.00
 Urban High = 60.00

Description:

This is a carry forward of the Rock Depth from the input sheet.

Cell:

Column	Label	Formula
L	Rock Hardness	=Input

Rural Low =
 Rural High =
 Urban Low =
 Urban High = HARD

Description:

This is a carry forward of the Rock Hardness from the input sheet.

**

Cell:

Column	Label	Formula
M	Surface Texture	=Input
	Rural Low =	SICL
	Rural High =	STV-SL
	Urban Low =	L
	Urban High =	CBV-SIL

Description:

This is a carry forward of the Surface Texture from the input sheet.

**

Cell:

Column	Label	Formula
N	Wtr Tbl Dpth	= Input
	Rural Low =	6.00
	Rural High =	6.00
	Urban Low =	6.00
	Urban High =	6.00

Description:

This is a carry forward of the Water Table Depth from the input sheet.

**

Cell:

Column	Label	Formula
O	Blank	Blank
	Rural Low =	
	Rural High =	
	Urban Low =	
	Urban High =	

Description:

This is a blank column.

**

Cell:

Column	Label	Formula
P	B	=G2*COS((PI()/180)*F2)
	Rural Low =	1,476.80
	Rural High =	34,379.12
	Urban Low =	2,658.64
	Urban High =	12,512.99

Description:

This formula calculates the distance along the main feeder route needed to reach the CBG. The calculation multiplies the airline distance from the CO to the centroid of the CBG, in Column G, by the cosine of the angle Alpha, in Column F. The Excel function (PI()/180) converts the measurement of the angle from degrees to radians for use with the cosine function.

**

Cell:

Column	Label	Formula
Q	A	=G2*SIN((PI()/180)*F2)

Rural Low = 951.00

Rural High = 4,538.31

Urban Low = 653.02

Urban High = 6,419.76

Description:

This formula calculates the distance from the main feeder route to the centroid of the CBG, assuming a right angle between the main feeder route and the line connecting it to the CBG centroid. The calculation multiplies the airline distance from the CO to the centroid of the CBG, in Column G, by the sine of the angle Alpha, in Column F. The Excel function (PI()/180) converts the measurement of the angle from degrees to radians for use with the sine function.

**

Cell:

Column	Label	Formula
R	Ttl Fdr Distnc	=IF(Q2>(0.5*V2),P2+Q2-(0.5*V2),P2)

Rural Low = 1,476.80

(IF is false)

Column	Label	Formula
R	Ttl Fdr Distnc	=IF(Q2>(0.5*V2),P2+Q2-(0.5*V2),P2)

Rural High = 34,379.12

(IF is false)

Column	Label	Formula
R	Ttl Fdr Distnc	=IF(Q2>(0.5*V2),P2+Q2-(0.5*V2),P2)

Urban Low = 2,658.64

(IF is false)

Column	Label	Formula
R	Ttl Fdr Distnc	=IF(Q2>(0.5*V2),P2+Q2-(0.5*V2),P2)

Urban High = 12,512.99

(IF is false)

Description:

This formula calculates the total feeder distance. If the distance between the main feeder route and the CBG centroid in Column Q is greater than one half the length of the side of the hypothetical square CBG, in Column V, then the total feeder distance is the sum of the main feeder length in Column P plus the distance in Column Q, minus one half the distance in Column V. Otherwise, the total feeder distance equals the distance in Column P.

Cell:

Column	Label	Formula
S	"A" Portn Fdr	= R2-P2

Rural Low = 0.00

Rural High = 0.00

Urban Low = 0.00

Urban High = 0.00

Description:

This formula calculates the distance of sub-feeder, if it exists. The sub-feeder distance equals the total feeder distance in Column R minus the main feeder distance in Column P.

Cell:

Column	Label	Formula
T	Distr Distnc	=0.75*V2

Rural Low = 2,989.73

Rural High = 36,438.46

Urban Low = 2,504.52

Urban High = 10,349.17

Description:

This formula calculates the average distribution plant distance within the CBG. The average distribution distance equals 0.75 multiplied by the length of the side of the hypothetical square CBG, in Column V.

Cell:

Column	Label	Formula
U	area-sq mi	=I2

Rural Low = 0.57

Rural High = 84.67

Urban Low = 0.4

Urban High = 6.83

Description:

This is a carry forward of the area of the CBG in square miles from Column I.

Cell:

Column	Label	Formula
V	D	=SQRT(U2)*5280

Rural Low = 3,986.31

Rural High = 48,584.61

Urban Low = 3,339.37

Urban High = 13,798.89

Description:

This formula calculates the length of the side of the hypothetical square CBG, in feet. The square root of the area (in square miles) of the CBG, in Column U, is multiplied by 5,280 in order to convert the distance to feet.

**

Cell:

Column	Label	Formula
W	Blank Column	Blank

Rural Low =

Rural High =

Urban Low =

Urban High =

Description

This is a Blank column

**

Cell:

Column	Label	Formula
X	Urban?	=IF(\$J2>850,"Y","N")

Rural Low = N

(IF is false)

Column	Label	Formula
X	Urban?	=IF(\$J2>850,"Y","N")

Rural High = N

(IF is false)

Column	Label	Formula
X	Urban?	=IF(\$J2>850,"Y","N")

Urban Low = N

(IF is false)

Column	Label	Formula
X	Urban?	=IF(\$J2>850,"Y","N")

Urban High = N
(IF is false)

Description:

This formula determines if the CBG is in an urban density group. If the household density per square mile, in Column J, is greater than 850 households per square mile, then the CBG is urban and the cell equals "Y". Otherwise, the cell equals "N".

**

Cell:

Column	Label	Formula
Y	Surfc Indicator	=IF(ISBLANK(M2),"",VLOOKUP(\$M2,SurfaceTextureTable.2,FALSE))

Rural Low = 0
(IF is false)

Column	Label	Formula
Y	Surfc Indicator	=IF(ISBLANK(M2),"",VLOOKUP(\$M2,SurfaceTextureTable.2,FALSE))

Rural High = 1
(IF is false)

Column	Label	Formula
Y	Surfc Indicator	=IF(ISBLANK(M2),"",VLOOKUP(\$M2,SurfaceTextureTable.2,FALSE))

Urban Low = 0
(IF is false)

Column	Label	Formula
Y	Surfc Indicator	=IF(ISBLANK(M2),"",VLOOKUP(\$M2,SurfaceTextureTable.2,FALSE))

Urban High = 1
(IF is false)

Description:

This formula determines whether the terrain condition for surface texture impacts the placement cost of the facility. If the formula returns a value of 1, the surface texture makes the placing of the facility difficult, however if the formula returns a value of 0, the placing costs are normal. If surface texture in Column M is blank, then the cell value is blank. Otherwise, the surface texture in Column M is checked in the Surface Texture Table in the Tables Tab, where each surface texture type is listed as having an impact on placing facilities or not having an impact.

VLOOKUP uses the following format: VLOOKUP(value to search for, range to search, column in the range to search, FALSE indicates that an exact match is being looked for). VLOOKUP searches down the first column of the range and goes to the line just above where the value fits in the column, then goes across to the designated column. The result reported is the value found in that answer cell.

**

Cell:

Column	Label	Formula
Z	Copper Depth Condition	<u>=IF(AND(\$K2<=NormalUGDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalUGDepth,\$Y2=0),3,2))</u>

Rural Low = 3

(First IF is false - second is true)

Column	Label	Formula
Z	Copper Depth Condition	<u>=IF(AND(\$K2<=NormalUGDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalUGDepth,\$Y2=0),3,2))</u>

Rural High = 2

(First IF is false - second is false)

Column	Label	Formula
Z	Copper Depth Condition	<u>=IF(AND(\$K2<=NormalUGDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalUGDepth,\$Y2=0),3,2))</u>

Urban Low = 3

(First IF is false - second is true)

Column	Label	Formula
Z	Copper Depth Condition	<u>=IF(AND(\$K2<=NormalUGDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalUGDepth,\$Y2=0),3,2))</u>

Urban High = 2

(First IF is false - second is false)

Description:

This formula determines whether addition placement costs will be caused due to bedrock being within the normal placement depth of the copper facilities and if the bedrock is described as hard. If the depth to bedrock in Column K is less than or equal to the normal placement depth of copper facilities, in Cell B2 of the Variables & Notes Tab, and the value of rock hardness in Column L equals "HARD", then the placement difficulty condition equals 1. If the depth to bedrock in Column K is greater than the normal placement depth of copper facilities, then the placement difficulty condition equals 3. Otherwise, the placement difficulty condition equals 2.

**

Cell:

Column	Label	Formula
AA	Fiber Depth Condition	<u>=IF(AND(\$K2<=NormalFiberDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalFiberDepth,\$Y2=0),3,2))</u>

Rural Low = 3

(First IF is false - second is true)

Column	Label	Formula
AA	Fiber Depth Condition	<u>=IF(AND(\$K2<=NormalFiberDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalFiberDepth,\$Y2=0),3,2))</u>

Rural High = 2

(First IF is false - second is false)

Column	Label	Formula
AA	Fiber Depth Condition	=IF(AND(\$K2<=NormalFiberDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalFiberDepth,\$Y2=0),3,2))

Urban Low = 3

(First IF is false - second is true)

Column	Label	Formula
AA	Fiber Depth Condition	=IF(AND(\$K2<=NormalFiberDepth,\$L2="HARD"),1,IF(AND(\$K2>NormalFiberDepth,\$Y2=0),3,2))

Urban High = 1

(First IF is true)

Description:

This formula determines whether addition placement costs will be caused due to bedrock being within the normal placement depth of the fiber facilities and if the bedrock is described as hard. If the depth to bedrock in Column K is less than or equal to the normal placement depth of fiber facilities, in Cell B3 of the Variables & Notes Tab, and the value of rock hardness in Column L equals "HARD", then the placement difficulty condition equals 1. If the depth to bedrock in Column K is greater than the normal placement depth of fiber facilities, then the placement difficulty condition equals 3. Otherwise, the placement difficulty condition equals 2.

**

Cell:

Column	Label	Formula
AB	Dist Ca Multplr	=IF(\$N2<3,1,3,1)*INDEX(CostFactorTable,0+IF(\$X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)

Rural Low = 0.279

(First IF is false - second is false - third is false - fourth is false - fifth is true)

Column	Label	Formula
AB	Dist Ca Multplr	=IF(\$N2<3,1,3,1)*INDEX(CostFactorTable,0+IF(\$X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)

Rural High = 0.369

(First IF is false - second is false - third is false - fourth is false - fifth is false -sixth if false)

Column	Label	Formula
AB	Dist Ca Multplr	=IF(\$N2<3,1,3,1)*INDEX(CostFactorTable,0+IF(\$X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)

Urban Low = 0.2905

(First IF is false - second is false - third is false - fourth is true)

Column	Label	Formula
AB	Dist Ca Multplr	=IF(\$N2<3,1,3,1)*INDEX(CostFactorTable,0+IF(\$X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)

$$\text{Urban High} = 0.388$$

(First IF is false - second is false - third is false - fourth is false - fifth is false - sixth if true)

Description:

This formula determines the correct distribution cable multiplier to reflect the impact of terrain upon structure investment. First, the formula checks if the depth to the water table, in Column N, is within 3 feet of the surface. If the water table depth is less than 3 feet then the structure multiplier for the additional difficulty of the high water table is 1.3. Otherwise, the formula uses an INDEX function to find the appropriate multiplier based upon whether the CBG is urban, in Column X, and secondarily based upon the specific density in Column J.

**

Cell:

Column	Label	Formula
AC	Fdr Ca Multplr	<u>=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,18+IF(\$X2="Y",IF(\$J2>255</u> <u>0,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)</u>

$$\text{Rural Low} = 0.279$$

(First IF is false - second is false - third is false - fourth is false - fifth is true)

Column	Label	Formula
AC	Fdr Ca Multplr	<u>=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,18+IF(\$X2="Y",IF(\$J2>255</u> <u>0,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)</u>

$$\text{Rural High} = 0.426$$

(First IF is false - second is false - third is false - fourth is false - fifth is false - sixth if false)

Column	Label	Formula
AC	Fdr Ca Multplr	<u>=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,18+IF(\$X2="Y",IF(\$J2>255</u> <u>0,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)</u>

$$\text{Urban Low} = 0.256$$

(First IF is false - second is false - third is false - fourth is true)

Column	Label	Formula
AC	Fdr Ca Multplr	<u>=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,18+IF(\$X2="Y",IF(\$J2>255</u> <u>0,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$Z2.6)</u>

$$\text{Urban High} = 0.4165$$

(First IF is false - second is false - third is false - fourth is false - fifth is false - sixth if true)

Description:

This formula determines the correct copper feeder cable multiplier to reflect the impact of terrain upon structure investment. First, the formula checks if the depth to the water table, in Column N, is within 3 feet of the surface. If the water table depth is less than 3 feet then the structure multiplier for the additional difficulty of the high water table is 1.3. Otherwise, the formula uses an INDEX function to find the appropriate multiplier based upon whether the CBG is urban, in Column X, and secondarily based upon the specific density in Column J.

**

Cell:

Column	Label	Formula
AD	Fiber Multplr	=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,36+IF(X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$AA2.6)

Rural Low = 1.404

(First IF is false - second is false - third is false - fourth is false - fifth is true)

Column	Label	Formula
AD	Fiber Multplr	=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,36+IF(X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$AA2.6)

Rural High = 2.03

(First IF is false - second is false - third is false - fourth is false - fifth is false - sixth if false)

Column	Label	Formula
AD	Fiber Multplr	=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,36+IF(X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$AA2.6)

Urban Low = 1.276

(First IF is false - second is false - third is false - fourth is true)

Column	Label	Formula
AD	Fiber Multplr	=IF(\$N2<3,1.3,1)*INDEX(CostFactorTable,36+IF(X2="Y",IF(\$J2>2550,0,3),IF(\$J2>650,6,IF(\$J2>200,9,IF(\$J2>5,12,15))))+\$AA2.6)

Urban High = 3.4375

(First IF is false - second is false - third is false - fourth is false - fifth is false - sixth if true)

Description:

This formula determines the correct fiber feeder cable multiplier to reflect the impact of terrain upon structure investment. First, the formula checks if the depth to the water table, in Column N, is within 3 feet of the surface. If the water table depth is less than 3 feet then the structure multiplier for the additional difficulty of the high water table is 1.3. Otherwise, the formula uses an INDEX function to find the appropriate multiplier based upon whether the CBG is urban, in Column X, and secondarily based upon the specific density in Column J.

DATA MODULE - OUTPUT TAB

**

Cell:

Column	Label	Formula
A	Company	=Data & Calcs!B2

Rural Low = MOUNTAIN BELL - UT

Rural High = MOUNTAIN BELL - UT

Urban Low = MOUNTAIN BELL - UT

Urban High = MOUNTAIN BELL - UT

Description:

Carry forward of the Company from the Data & Calcs sheet.

Cell:

Column	Label	Formula
B	Cli	= 'Data & Calcs'!A2

Rural Low	=	MNPLUTMA
Rural High	=	MNPLUTMA
Urban Low	=	OGDNUTNO
Urban High	=	OGDNUTNO

Description:

Carry forward of the Cli from the Data & Calcs sheet.

Cell:

Column	Label	Formula
C	Census blk grp	= 'Data & Calcs'!C2

Rural Low	=	490399721005
Rural High	=	490399721006
Urban Low	=	490572102021
Urban High	=	490572102023

Description:

Carry forward of the Census Block Group from the Data & Calcs sheet.

Cell:

Column	Label	Formula
D	Quadrant	= 'Data & Calcs'!D2

Rural Low	=	1
Rural High	=	4
Urban Low	=	1
Urban High	=	1

Description:

Carry forward of the quadrant number from the Data & Calcs sheet.

Cell:

Column	Label	Formula
E	<u>B</u>	= 'Data & Calcs'!P2

Rural Low = 1,476.80
 Rural High = 34,379.12
 Urban Low = 2,658.64
 Urban High = 12,512.99

Description:

Carry forward of Segment B from the Data & Calcs sheet.

Cell:

Column	Label	Formula
F	"A" Portn Fdr	= 'Data & Calcs'!S2

Rural Low = 0
 Rural High = 0
 Urban Low = 0
 Urban High = 0

Description:

Carry forward of the "A" portion feeder from the Data & Calcs sheet.

Cell:

Column	Label	Formula
G	Distr Distnc	= 'Data & Calcs'!T2

Rural Low = 2,989.73
 Rural High = 36,438.46
 Urban Low = 2,504.52
 Urban High = 10,349.17

Description:

Carry forward of the Distribution distance from the Data & Calcs sheet.

Cell:

Column	Label	Formula
H	TotHH	= 'Data & Calcs'!H2

Rural Low = 338
 Rural High = 311
 Urban Low = 305
 Urban High = 45

Description:

Carry forward of the total number of house holds from the Data & Calcs sheet.

Cell:

Column	Label	Formula
--------	-------	---------

I density-tothh/sqmi ='Data & Calcs'!J2

Rural Low = 589.32

Rural High = 3.67

Urban Low = 769.67

Urban High = 6.83

Description:

Carry forward of the density of total households per square mile from the Data & Calcs sheet.

Cell:

Column	Label	Formula
J	Dist Ca Multplr	=IF(A2=0,0,'Data & Calcs'!AB2

Rural Low = 0.279

Rural High = 0.369

Urban Low = 0.2905

Urban High = 0.388

Description:

Carry forward of the distribution cable multiplier from the Data & Calcs sheet.

Cell:

Column	Label	Formula
K	Fdr Ca Multplr	=IF(A2=0,0,'Data & Calcs'!AC2)

Rural Low = 0.279

Rural High = 0.426

Urban Low = 0.256

Urban High = 0.4165

Description:

Carry forward of the feeder cable multiplier from the Data & Calcs sheet.

Cell:

Column	Label	Formula
L	Fiber Multplr	=IF(A2=0,0,'Data & Calcs'!AD2)

Rural Low = 1.404

Rural High = 2.03

Urban Low = 1.276

Urban High = 3.4375

Description:

Carry forward of the fiber multiplier from the Data & Calcs sheet.

DATA MODULE - TABLES TAB

Structure Multiplier Tables

Columns:

A B C

Urban Copper Cable Table

Cost Multiplier			ROW:
Structure	UG \$	Aerial \$	3
RockH	1.53	0.69	4
RockS	1.22	0.48	5
Normal	1.11	0.48	6

Rural Copper Cable Table

Cost Multiplier			ROW:
Structure	UG \$	Aerial \$	7
RockH	0.66	0.8	8
RockS	0.35	0.54	9
Normal	0.21	0.44	10

Urban Fiber Table

Cost Multiplier			ROW:
Structure	UG \$	Aerial \$	11
RockH	9.02	3.5	12
RockS	7.22	2.5	13
Normal	6.56	2.5	14

Rural Fiber Table

Cost Multiplier			ROW:
Structure	UG \$	Aerial \$	15
RockH	3	4.25	16
RockS	1.45	2.9	17
Normal	1.02	2.3	18

Description:

The above tables list the investment relationship between the capitalized cost of placing the plant and the material investment in underground, buried, and aerial cable. There is a separate table for urban copper, urban fiber, rural fiber, and rural copper facilities. Each table then lists the multiplier applicable for plant used above ground or below ground in each of three terrain conditions -- hard bedrock within the

placement depth, soft bedrock within the placement depth or difficult surface texture soil types, and normal placement.

Underground/Aerial Mix Tables

Columns:			
M	N	O	
Distribution UG/Aerial Mix Table			
Density	UG%	Aerial%	ROW
0-5	90	10	6
5-200	80	20	7
200-650	70	30	8
650-850	65	35	9
850-2550	60	40	10
>2550	50	50	11
			12
			13
			14
			15
Copper Feeder UG/Aerial Mix Table			
Density	UG%	Aerial%	
0-5	60	40	17
5-200	65	35	18
200-650	70	30	19
650-850	80	20	20
850-2550	90	10	21
>2550	100	0	22
			23
			24
			25
			26
			27
			28
			29
			30
			31
Fiber Feeder UG/Aerial Mix Table			
Density	UG%	Aerial%	
0-5	60	40	33
5-200	65	35	34
200-650	70	30	35
650-850	80	20	36
850-2550	90	10	37
>2550	100	0	38
			39

Description:

The above three tables of inputs designate the percentages for each density group’s split of cable placement between below ground and above ground facilities. Separate tables are provided for fiber feeder, copper feeder, and distribution. The percent below ground is entered and the aerial reciprocal is then calculated. It is an estimate of the average national engineering data.

CostFactorTable

Row #	Plant Type	Urban/Rural	Density	Surface Category	Weighted Cost Factor
1	Distribution	Urban	>2550	RockH	=M2*((B5*\$N\$11/100)+(C5*\$O\$11/100))
2				RockS	=M2*((B6*\$N\$11/100)+(C6*\$O\$11/100))
3				Normal	=M2*((B7*\$N\$11/100)+(C7*\$O\$11/100))
4	Distribution	Urban	850-2550	RockH	=(B5*\$N\$10/100)+(C5*\$O\$10/100)
5				RockS	=(B6*\$N\$10/100)+(C6*\$O\$10/100)
6				Normal	=(B7*\$N\$10/100)+(C7*\$O\$10/100)
7	Distribution	Rural	650-850	RockH	=(B15*\$N\$9/100)+(C15*\$O\$9/100)
8				RockS	=(B16*\$N\$9/100)+(C16*\$O\$9/100)
9				Normal	=(B17*\$N\$9/100)+(C17*\$O\$9/100)
10	Distribution	Rural	200-650	RockH	=(B15*\$N\$8/100)+(C15*\$O\$8/100)
11				RockS	=(B16*\$N\$8/100)+(C16*\$O\$8/100)
12				Normal	=(B17*\$N\$8/100)+(C17*\$O\$8/100)
13	Distribution	Rural	5-200	RockH	=(B15*\$N\$7/100)+(C15*\$O\$7/100)
14				RockS	=(B16*\$N\$7/100)+(C16*\$O\$7/100)
15				Normal	=(B17*\$N\$7/100)+(C17*\$O\$7/100)
16	Distribution	Rural	0-5	RockH	=(B15*\$N\$6/100)+(C15*\$O\$6/100)
17				RockS	=(B16*\$N\$6/100)+(C16*\$O\$6/100)
18				Normal	=(B17*\$N\$6/100)+(C17*\$O\$6/100)
19	Feeder	Urban	>2550	RockH	=M2*((B5*\$N\$23/100)+(C5*\$O\$23/100))
20				RockS	=M2*((B6*\$N\$23/100)+(C6*\$O\$23/100))
21				Normal	=M2*((B7*\$N\$23/100)+(C7*\$O\$23/100))
22	Feeder	Urban	850-2550	RockH	=(B5*\$N\$22/100)+(C5*\$O\$22/100)
23				RockS	=(B6*\$N\$22/100)+(C6*\$O\$22/100)
24				Normal	=(B7*\$N\$22/100)+(C7*\$O\$22/100)
25	Feeder	Rural	650-850	RockH	=(B15*\$N\$21/100)+(C15*\$O\$21/100)
26				RockS	=(B16*\$N\$21/100)+(C16*\$O\$21/100)
27				Normal	=(B17*\$N\$21/100)+(C17*\$O\$21/100)
28	Feeder	Rural	200-650	RockH	=(B15*\$N\$20/100)+(C15*\$O\$20/100)
29				RockS	=(B16*\$N\$20/100)+(C16*\$O\$20/100)
30				Normal	=(B17*\$N\$20/100)+(C17*\$O\$20/100)
31	Feeder	Rural	5-200	RockH	=(B15*\$N\$19/100)+(C15*\$O\$19/100)
32				RockS	=(B16*\$N\$19/100)+(C16*\$O\$19/100)
33				Normal	=(B17*\$N\$19/100)+(C17*\$O\$19/100)
34	Feeder	Rural	0-5	RockH	=(B15*\$N\$18/100)+(C15*\$O\$18/100)
35				RockS	=(B16*\$N\$18/100)+(C16*\$O\$18/100)
36				Normal	=(B17*\$N\$18/100)+(C17*\$O\$18/100)
37	Fiber	Urban	>2550	RockH	=M2*((B24*\$N\$39/100)+(C24*\$O\$39/100))
38				RockS	=M2*((B25*\$N\$39/100)+(C25*\$O\$39/100))
39				Normal	=M2*((B26*\$N\$39/100)+(C26*\$O\$39/100))
40	Fiber	Urban	850-2550	RockH	=(B24*\$N\$38/100)+(C24*\$O\$38/100)
41				RockS	=(B25*\$N\$38/100)+(C25*\$O\$38/100)
42				Normal	=(B26*\$N\$38/100)+(C26*\$O\$38/100)
43	Fiber	Rural	650-850	RockH	=(B33*\$N\$37/100)+(C33*\$O\$37/100)
44				RockS	=(B34*\$N\$37/100)+(C34*\$O\$37/100)
45				Normal	=(B35*\$N\$37/100)+(C35*\$O\$37/100)
46	Fiber	Rural	200-650	RockH	=(B33*\$N\$36/100)+(C33*\$O\$36/100)
47				RockS	=(B34*\$N\$36/100)+(C34*\$O\$36/100)
48				Normal	=(B35*\$N\$36/100)+(C35*\$O\$36/100)
49	Fiber	Rural	5-200	RockH	=(B33*\$N\$35/100)+(C33*\$O\$35/100)

50			RockS	$=(B34*\$N\$35/100)+(C34*\$O\$35/100)$
51			Normal	$=(B35*\$N\$35/100)+(C35*\$O\$35/100)$
52 Fiber	Rural	0-5	RockH	$=(B33*\$N\$34/100)+(C33*\$O\$34/100)$
53			RockS	$=(B34*\$N\$34/100)+(C34*\$O\$34/100)$
54			Normal	$=(B35*\$N\$34/100)+(C35*\$O\$34/100)$

Description:

This table creates a weighted structure multiplier that reflects the percentage of aerial and below ground plant in each density group. The table creates three factors reflecting hard rock, soft rock or difficult surface texture, and normal conditions by density group for distribution facilities, copper feeder facilities, and fiber feeder facilities. The formulas in the table sum the products of the underground cost multiplier times the percent underground plant for the density group and the aerial cost multiplier times the percent of aerial plant for the density group. The formulas reference the Cost Multiplier Tables and the Underground/Aerial Mix tables.

Surface texture table

Texture	Impact?	Description of Texture
		0 Blank
BY		1 Bouldery
BY-SICL		1 Bouldery & Silty Clay Loam
BYV		1 Very bouldery
BYV-FSL		1 Very Bouldery & Fine Sandy Loam
BYV-L		1 Very bouldery & Loamy
BYV-LS		1 Very Bouldery & Loamy Sand
BYV-SIL		1 Very Bouldery & Silt
BYV-SL		1 Very bouldery & Sandy Loam
BYX		1 Extremely Bouldery
BYX-L		1 Extremely Bouldery & Loamy
BYX-SIL		1 Extremely Bouldery & Silt Loam
C		0 Clay
CB		0 Cobbly
CBA		1 Angular Cobbly
CB-C		0 Cobbly & Clay
CB-CL		0 Cobbly & Clay Loam
CB-COSL		0 Cobbly & Coarse Sandy Loam
CB-L		0 Cobbly & Loamy
CB-LS		0 Cobbly & Loamy Sand
CB-S		0 Cobbly & Sand
CB-SIL		0 Cobbly & Silt Loam
CB-SL		1 Cobbly & Sandy Loam
CBV		1 Very cobbly
CBV-C		1 Very Cobbly & Clay
CBV-CL		1 Very Cobbly & Clay Loam
CBV-L		1 Very cobbly & Loamy
CBV-SIL		1 Very Cobbly & Silt
CBV-SL		1 Very Cobbly & Sandy Loam
CBX		1 Extremely Cobbly
CE		0 Coprogenous Earth
CIND		0 Cinders
CL		0 Clay Loam

CM	1 Cemented
CN	0 Channery
CN-FSL	0 Channery & Fine Sandy Loam
CN-L	0 Channery & Loam
CN-SIL	0 Channery & Silty Loam
CN-SL	0 Channery & Sandy Loam
CNV	0 Very Channery
CNV-L	0 Very Channery & Loam
CNV-SIL	0 Very Channery & Silty Loam
CNV-SL	0 Very Channery & Sandy Loam
CNX	0 Extremely Channery
CNX-SL	0 Extremely Channery & Sandy Loam
COS	0 Coarse Sand
COSL	0 Coarse Sandy Loam
CR	0 Cherty
CRC	1 Coarse Cherty
CR-L	1 Cherty & Loam
CR-SIL	1 Cherty & Silty Loam
CRV	1 Very Cherty
CRV-L	1 Very Cherty & Loam
CRX	1 Extremely Cherty
DE	0 Diatomaceous Earth
FB	0 Fibric Material
FL	0 Flaggy
FL-L	0 Flaggy & Loam
FL-SICL	0 Flaggy & Silty Clay loam
FL-SIL	0 Flaggy & Silty Loam
FLV	1 Very Flaggy
FLX	1 Extremely Flaggy
FLX-L	1 Extremely Flaggy & Loamy
FRAG	0 Fragmental Material
FS	0 Fine Sand
FSL	0 Fine Sandy Loam
G	0 Gravel
GR	0 Gravelly
GRC	0 Course Gravelly
GR-C	0 Gravel & Clay
GR-CL	0 Gravel & Clay Loam
GR-COS	0 Gravel & Course Sand
GR-COSL	0 Gravel & Coarse Sandy Loam
GRF	0 Fine Gravel
GR-FS	0 Gravel & Fine Sand
GR-FSL	0 Gravel & Fine Sandy Loam
GR-L	0 Gravel & Loam
GR-LCOS	0 Gravel & Loamy Course Sand
GR-LFS	0 Gravel & Loamy Fine sand
GR-LS	0 Gravel & Loamy Sand
GR-S	0 Gravel & Sand
GR-SCL	0 Gravel & Sandy Clay Loam
GR-SIC	0 Gravel & Silty Clay
GR-SIL	0 Gravel & Silty Loam
GR-SL	0 Gravel & Sandy Loam
GRV	1 Very Gravelly
GRV-CL	1 Very gravelly & Clay Loam
GRV-COS	1 Very Gravelly & Course Sand
GRV-COSL	1 Very Gravelly & Course Sandy Loam
GRV-FSL	1 Very Gravelly & Fine Sandy Loam

GRV-L	1 Very Gravelly & Loam
GRV-LCOS	1 Very Gravelly & Loamy Course Sand
GRV-LS	1 Very Gravelly & Loamy Sand
GRV-S	1 Very Gravelly & Sand
GRV-SCL	1 Very Gravelly & Sandy Clay Loam
GRV-SIL	1 Very Gravelly & Silt
GRV-SL	1 Very Gravelly & Sandy Loam
GRX	1 Extremely Gravelly
GRX-COS	1 Extremely Gravelly & Coarse Sand
GRX-L	1 Extremely Gravelly & Loam
GRX-S	1 Extremely Gravelly & Sand
GRX-SL	1 Extremely Gravelly & Sandy Loam
GYP	1 Gypsiferous Material
HM	0 Hemic Material
ICE	1 Ice or Frozen Soil
IND	1 Indurated
L	0 Loam
LCOS	0 Loamy Course Sand
LFS	0 Loamy Fine Sand
LS	0 Loamy Sand
LVFS	0 Loamy Very Fine Sand
MARL	0 Marl
MK	0 Mucky
MK-C	0 Mucky Clay
MK-CL	0 Mucky Clay Loam
MK-FSL	0 Muck & Fine Sandy Loam
MK-L	0 Mucky Loam
MK-SIL	0 Mucky Silt
MK-VFSL	0 Mucky & Very Fine Sandy Loam
MPT	0 Mucky Peat
MUCK	0 Muck
PEAT	0 Peat
PT	0 Peaty
RB	1 Rubbly
S	0 Sand
SC	0 Sandy Clay
SCL	0 Sandy Clay Loam
SG	0 Sand and Gravel
SH	0 Shaly
SH-CL	0 Shaly & Clay
SH-L	0 Shale & Loam
SH-SICL	0 Shaly & Silty Clay loam
SH-SIL	0 Shaly & Silt Loam
SHV	1 Very Shaly
SHV-CL	1 Very Shaly & Clay Loam
SHX	1 Extremely Shaly
SI	0 Silt
SIC	0 Silty Clay
SICL	0 Silty Clay Loam
SIL	0 Silt Loam
SL	0 Sandy loam
SP	0 Sapric Material
SR	0 Stratified
ST	0 Stony
ST-C	0 Stony & Clay
ST-CL	0 Stony & Clay Loam
ST-COSL	0 Stony & Course Sandy Loam

ST-FSL	0 Stony & Fine Sandy Loam
ST-L	0 Stony & Loamy
ST-LCOS	0 Stony & Loamy Course Sand
ST-LFS	0 Stony & Loamy Fine Sand
ST-LS	0 Stony & Loamy Sand
ST-SIL	0 Stony & Silt Loam
ST-SL	0 Stony & Sandy Loam
STV	1 Very Stony
STV-CL	1 Very Stony & Clay Loam
STV-FSL	1 Very Stony & Fine Sandy Loam
STV-L	1 Very Stony & Loamy
STV-MUCK	1 Very Stony & Muck
STV-SICL	1 Very Stony & Silty Clay Loam
STV-SIL	1 Very Stony & Silty Loam
STV-SL	1 Very Stony & Sandy Loam
STX	1 Extremely Stony
STX-C	1 Extremely Stony & Clay
STX-CL	1 Extremely Stony & Clay Loam
STX-L	1 Extremely stony & Loamy
STX-LCOS	1 Extremely Stony & Loamy Course Sand
STX-SIL	1 Extremely Stony & Silty Loam
STX-SL	1 Extremely stony & Sandy Loam
SY	1 Slaty
SY-SIL	1 Slaty & Silty Loam
SYV	1 Very Slaty
SYX	1 Extremely Slaty
UNK	0 Unknown
UWB	1 Unweathered Bedrock
VAR	0 Variable
VFS	0 Very Fine Sand
VFSL	0 Very Fine Sandy loam
WB	1 Weathered Bedrock

Description:

This table lists the surface texture impact for each soil surface texture. Each surface texture is classified as a 1 or a 0. A classification of 0 means that the surface texture does not impact the use of a plow to place buried plant. A classification of 1 means that the surface texture causes additional costs of placing facilities because of the need to change to more expensive methods of placing plant, such as backhoes and trenching machines. The source of the soil surface texture data is the USGS information. The U.S. Department of Agriculture's Soil Survey Manual was used to interpret the impact of the soil surface textures.